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YOUR LAND AND ITS USE IN THE KAMAS VALLEY SOIL CONSERVATION DISTRICT



UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

PA-166

Issued October 1951

A Message From the District Supervisors to Farmers in the Kamas Valley

You are facing some difficult problems in trying to keep up your farm production. We, as supervisors of the Kamas Valley Soil Conservation District, realize this because we too face these problems on our farms.

For one thing, we know that our soils are not as fertile as they used to be. Crop yields have been going down—especially yields of hay on the meadows. And while yields have gone down, we have been changing our livestock from beef cattle and sheep to dairy cattle. This has increased our needs for hay and other feeds. In other words, we need more feed but our soils are producing less.

We also have a shortage of water during the late summer. We need to make some arrangement for additional water late in the season.

These are only the major problems. There are others. The soil conservation district was organized to help solve these problems. By working together through the district we can do more than by each of us working alone. One of the things we have done was to get help from the United States Soil Conservation Service.

One of the first things the Soil Conservation Service did was to make a survey to learn as much as possible about the land and what it needed. This booklet tells about your land and what can be done about the problems. Every farmer in the district should read it. It will help all of us to understand what our land is and what we can best do with it.

A handwritten signature in cursive script, reading "J. Clyde Van Cassel". The signature is written in dark ink and is positioned above the printed name and title.

*Chairman, Board of Supervisors,
Kamas Valley Soil Conservation District.*

Your Farm Has Been Mapped

Soil conservation surveyors have gone over the farms in Kamas Valley field by field. Using an auger or spade, they examined and sampled the soil. In this way they learned how deep it is, what kind of material is underneath, how heavy or light it is, and the height of the water table. They measured the slopes of the land and how much erosion had occurred, if any, and they recorded the kind of crops being grown on the land. They put all of this information on aerial photographs. This soil conservation survey map shows what the land on your farm is like and helps you to know what it needs.

Here are some of the things this survey has shown us:

1. Many of our soils are underlain by gravel or cobbles. The thickness of the loamy soil above the gravel generally ranges from 10 to 36 inches.
2. Nearly 11,000 acres of land in the Kamas Valley are so wet that they will not grow the ordinary field crops. Much of the land needs to be drained so that better hay and pasture can be grown. Broadleaf sedge, a low-value feed, has come into most of the meadows.
3. The survey did not show any alkali land in the valley. The light-



Land-capability map of a farm in the district. The class II land on this farm is good soil on a gentle slope. The class III land is shallow soil over gravelly material, or good soil on a slope of 4 percent. The class IV land is somewhat wet, and the class V land is too wet for any cultivation. Symbols in fractional form show the kind of soil, steepness of slope, and degree of soil erosion. Letters show the land use: L, cropland, and P, grazing land. A map like this has been made of your farm. You may request it from your district supervisor or from the Soil Conservation Service headquarters located at Kamas.

colored soils along lower Beaver Creek get their color from lime carried there by water from the higher land. (This higher land is slowly becoming acid or sour, which means we may have to add lime to it some day if we continue to overirrigate and wash away the necessary plant foods.)

4. Every farm tested had in its soil less than one-half the amount of phosphorus needed to grow good crops. The average soil in the valley has about one-sixth enough. One of the reasons for this is that many of us have been taking crops off our land for years without putting anything back into the soil.

A soil should have 16 to 20 pounds of available phosphorus in a million pounds of soil to grow good quality crops. The average for the Kamas Valley was only 3 pounds of phosphorus per million pounds of soil. Soils low in fertility not only produce low yields, but crops of poor quality.

In a dairy country such as ours, applying phosphate on the land pays dividends through larger calf crops and better boned, higher producing animals.

5. Organic matter in every soil tested is almost twice the average amount for farm lands in Utah. Yet the available nitrogen supply is unusually low in these soils. This is due to prolonged cropping without returning plant food to the soil, to heavy application of irrigation water year after year, and to injury to the soils by poor farming practices.

We depend on bacteria in the soil to make the nitrogen available for plant use. The bacteria, in turn, depend upon fresh supplies of organic matter for food. We have the factory but we don't let it work. Early spring irrigation, before the ground has warmed up, slows up the bacteria, for they need heat as well as moisture and food. Nitrogen that could be used by plants is carried away in the water and we never quite catch up again all season.

Barnyard manure is the best source of nitrogen on our farms. Commercial nitrogen may be considered but it should be applied only after using all available manure. Turning under a green manure is highly desirable but often is not practical in a livestock-and poultry-producing community.

6. More than 1,500 acres of land have lost over half their topsoil. Improper farming methods have contributed to erosion and bad soil structure on much of the benchland. This land does not take water as well as it should, nor does the soil hold moisture as long as it once did.

Erosion has carried away topsoil and some of us are farming tough, heavy, clay subsoil. Poor irrigating practices on spring grain have speeded erosion and caused serious damage.



Sprinkler irrigation makes it possible to add the right amount of water on this moderately deep, sloping, class III land. Deep cuts for land leveling would expose the gravel underlying such land. By following this sprinkler method no water is wasted and no topsoil is eroded away.

7. Lack of good rotations, with land in small grain too many years, has broken down the soil structure. Leaving the land in a single crop too many years has contributed to the general decline in yields. On two farms, the average yield of alfalfa for stands under 6 years of age was almost 3 tons per acre. On stands 13 to 14 years old, where lawnglass, dandelion, and cheatgrass have come in, average yield was less than 2 tons per acre. If we improve our alfalfa stands we won't need to truck in some 2,000 tons of hay per year. The money saved can be used to improve our own valley.
8. Analyses showed no lack of potash in any soil tested. We need not spend money for fertilizer containing this element.

What Kind of Land Do You Have?

All of the information that the soils men placed on the maps was used to classify the land according to the uses for which it is best suited. This helps determine what can be done to improve the land and to keep it productive. The classification is not based entirely on how much the land will produce, but also on what conservation and soil-management practices must be used to keep it in full production. There are eight different classes of land in the Kamas Valley District, and several distinct kinds of land in some of the classes.



Class I land. The soil is deep and loamy. The land is almost level. The field on the left is in alfalfa, to the right is spring wheat.

Class I Land

Class I land can be farmed regularly; it needs only good management to keep it productive. It is nearly level and not waterlogged. The soil is deep—at least 3 feet over gravel—free from stones, loamy, and easy to work. Since there is little land in the valley that is nearly level (less than 1-foot fall in 100 feet), there is only a small amount of class I land. Poor farming methods, like plowing when too wet, or irrigating too much, will injure even this good land.

On level land the length of run—the distance the water has to travel from the ditch turn-out until it gets to the end of the field—is often too long. This causes the upper part of the field to get too much water and the lower end not enough. Or, if the water is run until the lower end is well-irrigated, there is usually a lot of waste water. More laterals from the head ditch and shorter runs will help this condition. Some farmers have found that by using corrugations and furrows, about 18 to 22 inches apart, time and water are saved.

“Border” irrigation has not been used in the Kamas Valley. But it might be used where the cross slope is almost level and the down slope very gentle. Low borders or ridges, 6 to 8 inches high, are thrown up every 30, 40, or 60 feet, depending on how level the land is and the size of the stream for irrigation. Then the space between the borders is flooded.

Class II Land

Class II land is good land that can be cultivated safely but requires a few special practices to keep it productive. In Kamas Valley it is deep or moderately deep, having more than 20 inches of loamy soil over the gravel. It is gently sloping—there is a 1- to 3-foot fall in 100 feet. The water table in most of this land is 4 feet or more below the surface.

You usually find this land at the base of the foothills. Most of it is called benchland. A considerable acreage of this type of land lies just east of Francis.

Most of the land in class II should be “leveled.” In the moderately deep soils, you will need to watch the depth of cuts carefully so that not too much soil will be removed. It is well to keep as much soil over the gravel as possible; therefore, be careful in selecting the fields to level. A soil auger will help you to determine the soil depth and an engineering survey is necessary to determine how best to handle each field.

Twenty-three percent of the Kamas Valley is class II land.

To keep class II land productive you will need to follow a crop rotation. That is, after growing a row crop and a grain crop or two, seed the land to hay and leave it for a few years to help build up the organic matter and nitrogen.

You will need to fertilize with phosphate. Also you will need nitrogen fertilizer to get pastures started. After you add new supplies of organic matter to the soil, less nitrogen fertilizer may be needed. Use 250 to 300 pounds of 16-20-0 fertilizer for pastures. When seeding alfalfa, use 300 pounds of treble superphosphate. This is a general recommendation. You will need to vary it some, depending upon the kind of soil you have and how it has been handled in the past.



Class II land. The soil is moderately deep and planted to alfalfa. The wet swale on the right is class IV land. The ridge and wet swale lands are typical of many acres in Kamas Valley.

Class III Land

Class III land is moderately good land but more difficult to keep in full production than class II land. You do not have as wide a choice in what you can do with it nor in the crops that will do well. About 14 percent of the valley is class III.

Some of the class III land has deep soil like class II but is steeper. It must be irrigated carefully or it will wash badly. You need to be especially careful with water because on these slopes you are likely to get erosion. Crop rotations are very important. This land needs the same kinds and amounts of fertilizer as recommended for class II land.

Other class III land is shallow. There are only 10 to 20 inches of soil over gravel. It can't hold much water. Consequently, it must be irrigated frequently and lightly. Heavy irrigation leaches the plant foods away. Careful irrigation to prevent leaching and erosion of these soils is necessary. Crop rotations are just as important as on sloping class III land.

The land just above the wet meadows is also class III. It makes good pasture if seeded to the proper mixture. Alfalfa and general field crops won't grow well unless the land is drained.



Class III land. Even though the soil is shallow, these lands may be very productive if properly managed and adequately fertilized.



Class IV land. The soils are very shallow over gravel and cobble and are not well suited to regular cultivation. Many of the stones have been hauled off, as shown by the rock pile beyond the cows. This is good irrigated-pasture land.

Class IV Land

Class IV land is not very well suited for cultivation. Its best use is for hay or pasture but you can plow it occasionally to reseed the grass. The problems are similar to those on class III land but more serious and therefore harder to overcome. About 33 percent of the valley is class IV land. There are three different kinds of class IV land in the district.

First are the deep soils, which are like those in class II, except that they are steeply sloping, and have a 6- to 10-foot fall in every 100 feet. Some of this land is already eroded, and all of it will erode if it isn't properly handled.

The very shallow soils, made up of those with less than 10 inches of loamy soil over gravel or cobble, are also on class IV land. Much of this land is rolling.

To irrigate rolling land it is a general practice to take the water out in a ditch along the top of the ridge and spread it down the slopes on both sides with a series of dams and checks. More ditches, carrying only small heads of water, taken out on the contour below the top of the ridge, will spread the water more evenly. These ditches will also



Harvesting hay on class IV land. The soils are moderately deep but the land slopes 9 feet in each 100 feet. This land is being properly used. The hay—consisting of timothy, redtop, bluegrass, and alsike clover—forms a good protective cover against erosion. Good farming and fertilizer practices have produced 2 tons or more of excellent hay on this field.



A side view of class IV land—thin topsoil over gravel and cobble. Many of the soils in Kamas Valley are like this. We can't afford to lose that thin top layer.

pick up waste water which may be reused. Keeping these steep and shallow lands in hay most of the time helps to build topsoil and keep it in place.

Then there is wet land where the water table comes practically to the surface. If properly managed as pasture, it produces good amounts of valuable feed that is converted directly into dairy products and meat without harvesting costs.

Management of Irrigated Pasture

Well-drained land can be plowed and seeded to a good pasture mixture. The Utah State Agricultural College recommends the following pasture mixture for this kind of land:

Orchard grass.....	3 pounds per acre.
Smooth brome grass.....	4 pounds per acre.
Tall meadow oat.....	4 pounds per acre.
Ladino clover.....	1 pound per acre.
Red clover.....	3 pounds per acre.
Ranger alfalfa.....	3 pounds per acre.

Some of the land can't be drained very well, but shallow surface drains should be installed. These will take the water off the surface and make better pastures possible. The agricultural college recommends the following mixtures for wet land:

Reed canarygrass.....	8 pounds per acre.
Alsike clover.....	2 pounds per acre.
Red clover.....	3 pounds per acre.
Strawberry clover.....	1 pound per acre.

The above rates are for well-prepared seedbeds. If seedbed is in poor condition or the seed is harrowed in, the above mixtures should be increased about 25 percent.

Land that cannot be drained can be made more productive by seeding a mixture of Reed canarygrass and strawberry clover.

Here are a few simple "do's" and "don't's" that will help you to establish and maintain a good pasture:

1. Don't irrigate too early or while animals are in the pasture.
2. Irrigate at about 2-week intervals on deep soils and 1-week intervals on very shallow soils.
3. Don't use too much water. Apply about 2 to 4 acre-inches of water at each irrigation, depending on soil depth.
4. Drain land where needed and where this can be done.
5. Control grazing. Divide your pasture into several units and rotate grazing. Rotation grazing increases the carrying capacity and helps the pasture to last longer.



Class IV land. Meadow pasture along the Weber River bottoms. The soils are moderately deep, but there is a high water table much of the time. The dead trees were "ringed" and will be removed.

6. Level the land where needed if the surface soil is deep enough so that leveling will not expose the gravel. Just smoothing off some of the humps and filling in holes will make irrigation easier and more effective.
7. When meadows have run out or have been taken over by sedges, reseeding is necessary. Remove the old stand by plowing and disking. If you can, it is a good idea to grow a crop or two of grain before reseeding to pasture. Before reseeding, prepare a good, firm seedbed.
8. Fertilize pastures generously. Ten tons of manure per acre every other year or every third year, along with 200 pounds of treble superphosphate, has been shown to double the pasture yield. Two hundred-fifty to three hundred pounds of ammoniated phosphate per acre have given good results in Kamas Valley.
9. Harrow or brush once or twice a year to scatter droppings.
10. Clip at least once a year, more often if necessary. This will remove old ungrazed clumps, make the pasture more uniform with good palatable forage, and prevent weeds from going to seed. Clipping should be done before weeds mature their seeds.

There are many acres of land along the Weber and Provo Rivers that can be turned into excellent pasture. Most of this land now is covered with rather thick stands of cottonwood and willows. To make the best pasture, the willows should be removed and cottonwoods thinned. Leave some trees for shade for the livestock.

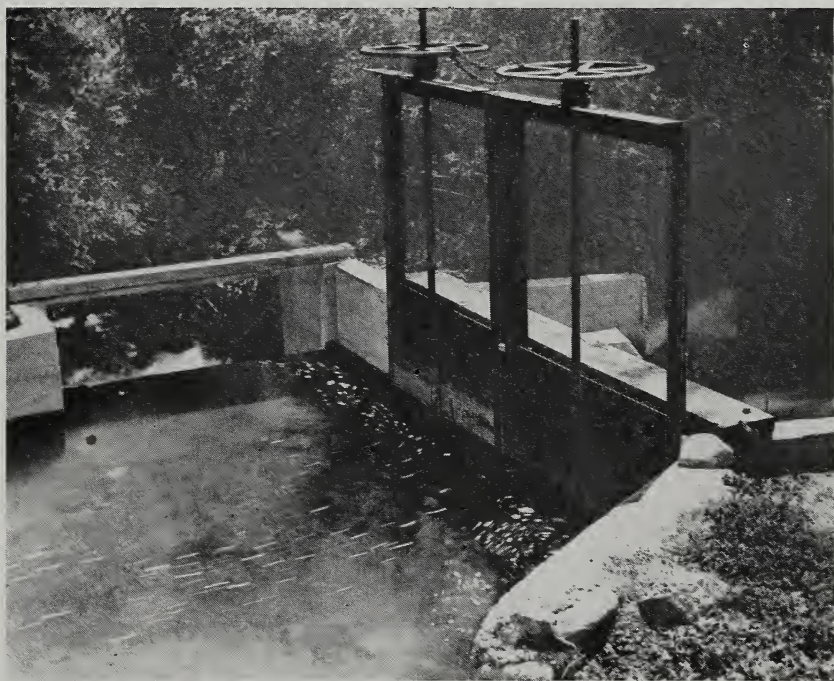
Much of this land will need some leveling, or at least to have the surface smoothed off, before it can be irrigated.

Irrigation

All the land in classes I, II, III, and IV is irrigated. Irrigation is one of the most important practices affecting crop production in the Kamas Valley.

Since there are no storage reservoirs of any size above Kamas Valley, we have to depend on stream flow for irrigation. That means that in the spring and early summer there is generally lots of water, but later in the summer the supply falls short. As a result, some farmers start irrigation too early in the spring. This is not good, because when cold water is poured on cold land it takes longer for the land to warm up enough for the plants to start growing.

Also, the abundance of water in the spring and short supply later in the summer causes many farmers to use too much water. In fact, some farmers erroneously believe that the more water they put on the land in the spring the more there will be in the soil later in the



Weirs and headgates make measurement and control of water easier. The gates regulate the water going into the canals. The excess water goes over the spillway at the left and back into the Weber River.

summer. Soil is somewhat like a tub—it can hold only so much. When the tub is filled, the rest of the water drains away and is wasted. Use just the amount of water that the soil can hold. Using too much water is bad. The excess washes out a lot of good plant food. It waterlogs your land or other land below you. For the most part the swamps, the bog areas, and the waterlogged areas in our district are man-made. Many of them have come into existence during the last 100 years. Heavy irrigation on steep slopes and shallow benchlands causes extra water to find its way to the low areas in the valley.

Good irrigation practices require that the farmer know how much water he is using and how deep the water is going into his soil. It is not enough just to turn a stream of water on your land and let it run for 24 hours or until the land looks wet. You may be using too much water or not enough. In other words, good irrigation requires that the water put on land be a measured amount just as you would measure the amount of oats you feed to your horses. To do this it will, of course, be necessary for us to have measuring devices on our canals, field ditches, and turn-outs, such as flumes, weirs, and gates, and a soil auger to check the depth of penetration.



Water from springs and waste water from fields can be stored in farm ponds for use when the river is low. Wherever permanent water can be maintained, such ponds could be managed for fish production.



Class V land. Too shallow and stony for cultivation. It makes better meadows when the stones are removed and the land irrigated lightly.

We know a good irrigation system, with its diversion structures, head gates, measuring flumes, and the construction and maintenance of canals, is expensive. But over a period of a few years the cost of labor, materials, and upkeep that go into temporary structures often exceeds the cost of permanent structures, to say nothing about the peace of mind of having a structure you know you can depend on.

Storage or collection ponds are useful on farms where some irrigation water comes from springs. The water can be collected and then applied to the land more quickly and with larger heads. This additional water may be a big help in the late summer when the regular irrigation supply is short.

By good irrigation we can save water and plant food, and reduce the waterlogging of our arable land.

Class V Land

Class V land is too wet, too shallow, or too stony for cultivation. It can be used for pasture or trees. You find sizable areas of it along the Weber and Provo River bottoms. Much of this land is now in irrigated pastures. Frequent light irrigations are best for this land. If you can drain the surface off, do so. Then plant to the proper mixture as suggested under Management of Irrigated Pastures. Remove the stones, clip and control weeds, and rotate the grazing. It will become some of the most profitable land on your farm.

Class VI and Class VII Land

Some of the marshy land in the valley is class VI land, which is not suited for cultivation but is well suited for other uses. Wet class VI land can be improved by putting in ditches to carry off the surface water. Class VII land is not suited for cultivation and is only fairly well suited for other uses. Much of the class VI and VII land is dry range land above the canals—the sage, oak brush, aspen, and timber areas. This is the watershed land that makes it possible to have water in the canals. We cannot afford to mismanage it.



Class VI and VII land. Sagebrush on class VI land can be cleared and seeded to grass. The steeper slopes, covered with oakbrush, are class VII land and ordinarily, should not be disturbed. The dense cover protects the soil from erosion. The sagebrush land in the lower picture has been cleared and seeded to crested wheatgrass. Note how the grass covers the soil as compared with the bare, cracked soil in the sage.

Improve Condition of Your Range

Rain and melted snow turned out of nature's head gate on range land will produce a bumper forage crop and a reliable supply of irrigation water. On ranges that are in good condition, forage plants produce an abundance of feed with only part of the water, and the unused, silt-free water works its way gradually downhill. Poor forage plants, such as sagebrush, do not use water efficiently, do not produce good forage, and do not hold the soil in place. Water from ranges in poor condition carries soil into the irrigation ditches to clog them. There is no sustained flow, and late-season water shortages are common.

Range land in good condition has an abundance of healthy, vigorous forage plants that produce a large volume of feed. The topsoil contains a mass of living fibrous roots that hold the soil in place. The ground surface is well-covered with plant litter that serves to enrich the soil, increase water penetration, and check rapid water runoff and soil loss.

Range in poor condition may lack good forage plants and much of the ground surface may be bare or occupied by plants that do not have the ability to control water runoff and soil loss.

It pays to keep range in good condition for top livestock feed production and a stable water supply.

Remember that about half of the food that plants manufacture each year is needed to keep the plants growing properly. Don't let livestock chew off the last few inches of new growth needed to keep the grass healthy and productive.

If your range has not gone too far toward poor condition, its condition and production can be built up by a system of deferment and rotation grazing and by making sure that plenty of forage plant residues stay on the ground.

For seeding, consider first those areas in poor condition which still have a fair amount of good soil.

On sagebrush land at the lower elevations in Kamas Valley, use the following procedure in reseeding:

1. Clear the sage by disking or plowing in the spring of the year or by controlled burning in late summer. A State permit is required for burning.
2. Seed in the fall or very early in the spring. Use a drill wherever possible. Broadcast and harrow areas that cannot be drilled.
3. Seed a mixture of 6 to 10 pounds of crested wheatgrass and smooth brome. One to 2 pounds of yellow sweetclover may be added to the mixture.

On mountain brush (oak, chokecherry, maple, etc.) and aspen ranges of higher elevations, use the following procedure in reseeding:

1. Clear by disking or plowing open parklike areas that are in poor condition.
2. Drill seed or broadcast and harrow these cleared areas in the fall of the year.
3. Broadcast before leaves fall on aspen, chokecherry, maple, or oak range that is in poor condition.
4. Seed a mixture of smooth brome and orchard grass at the rate of 8 to 12 pounds per acre when drilling. Add a little crested wheatgrass at lower elevations or tall meadow oatgrass at higher elevations.

Don't expect your newly seeded area to look like a wheatfield in the first year. Do not graze until seeding is well established. After the stand becomes established, graze it moderately so that it will maintain high production.

Give your range a chance, and don't overwork it. On this basis, it will swap fat livestock and clear water for good management on your part.

Class VIII Land

Class VIII land cannot be cultivated, and is not suited for grazing or timber production. It may have some value for wildlife, and any brush or other vegetation that will grow on it should be left for watershed protection. Since its greatest value is as a source of water for irrigation, livestock should not be allowed on it.

You live in or near the best of the big game and fishing country. It is decidedly an asset to you, your children, and the community, and it is worth keeping that way.

Sage chicken, willow grouse, and pine hen are fast approaching extinction in the community, as the passenger pigeon and heath hen have vanished in the East. When they are gone we will have lost just a little of what makes living worth while.

In less than a day's travel in any direction, one can see areas in the State which once had live streams pure and sparkling with plenty of fish and small fur-bearing animals. They are now silt-laden, gutted-out ravines, a menace to the land, and as unsuited to wildlife as the salt flats.

Only by careful guardianship of our watersheds can we prevent that here.

As livestock men, citizens, and sportsmen, we owe it to ourselves to see both sides of the picture and to achieve the balance of plant life, livestock, and game that makes the valley a better place in which to live. A fat steer or a fat deer on a cool frosty morning makes a picture people in many parts of the world are never privileged to see. Let us keep them both!

Weeds and Their Control in Kamas Valley

Another problem in Kamas Valley is the spread of noxious weeds. Unless the spread is stopped, noxious and poisonous weeds could well become a serious handicap to the livestock industry.

According to a report of the agricultural agent in Summit County it was estimated in 1946 that there were 1,200 acres of noxious weeds in the county of which 600 were in Kamas Valley. His report shows that Canadian thistle was the most widespread weed pest but that there were also areas infested with whitetop, morning glory, Russian knapweed, leafy spurge, and burdock. These weeds, especially Canadian thistle and whitetop, are widely scattered along streams, roads, and fence rows, on hill and mountain range land, and on farm land. So you can see that because of this already widespread condition, it will be a battle to stop the spread of weeds and get rid of the old stands.

The county agent says that during the last few years money set up for weed control has been steadily increased and that the acreage treated in 1948 was double that of 1947. "Progress is being made, but still the program is not large enough to fully cope with the problem," he says.

Under the present setup, the weed-control program is directed by the county weed committee, with a county chairman and a director in each of seven weed districts in the county. Funds are furnished by the State and county and supplemented by payments from landowners for actual work done on their property. Payments are also made through the PMA to farmers who take part in this program.



Class IV land in pasture. The vegetation is largely lupine, which is sometimes poisonous to livestock, and Canadian thistle. These plants crowd out the better vegetation. Mowing before the plants seed helps control these weeds.

What You Can Do To Improve Your Land—How the District Can Help You

There is an old English saying: "Live as though you were going to die tomorrow, farm as though you were going to farm forever."

Farming as though you were going to farm forever is conservation farming.

You can plan for the wise use and conservation of your land. You can carry out practices that will keep your land in good condition. You can obtain an aerial picture of your land, a report on the soils, a land-capability map, and assistance in preparing a farm or ranch plan. All these you can obtain through your Kamas Valley Soil Conservation District. Agencies such as the Soil Conservation Service, Forest Service, Extension Service, and the Utah Agricultural Experiment Station will assist you with your problems.

To keep informed about the condition of your land, watch the growth of crops, grass, weeds, and trees. Notice whether any water running off your land is clear or whether it is soil-colored and loaded with silt. Does rain or irrigation water go into your soil readily or does the surface only get wet and the rest of the water run off? You can easily tell how deep the water is going into the ground by using a soil auger. Your land-capability map and your observations will tell you what areas can be farmed safely, what kind of crops are best suited to your land, and what needs to be done to increase yields and to keep the land producing.

You can get the answers to these questions and manage your farm or ranch to include practices that protect and improve your land. **YOU CAN WORK WITH YOUR NEIGHBORS IN PLANNING AND PROTECTING ALL THE LAND IN YOUR COMMUNITY.**

There are nearly 2,400 soil conservation districts in the United States and Territories. All of them were organized by local people for the purpose of soil and water conservation. Through these districts, group action can accomplish conservation operations that would be impossible for an individual. Get acquainted with the policies of your soil conservation district and work with your district supervisors.

